Dogs That Haven't Barked: Towards an Understanding of the Absence of Expected Technological Threats
A Workshop Bibliography

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Dogs That Haven't Barked: Towards an Understanding of the Absence of Expected Technological Threats
Workshop Bibliography

Workshop convened 6-7 July 2016 by the
Center for Global Security Research
Lawrence Livermore National Laboratory

Compiled by Mallory Roseman and Fareeda Zikry

Lawrence Livermore National Laboratory's Center for Global Security Research hosted a workshop to investigate why some consistently predicted threats from science and technology (S&T) have not manifested with the impacts to international security as forecasted. During the workshop, "Dogs That Haven't Barked: Towards an Understanding of the Absence of Expected Technological Threats," participants used two specific cases to focus the discussion: biotechnology and man-portable air defense systems (MANPADS). Experts moderated discussion based on the four topics below. We have compiled a short list of relevant literature here.

- Considering the Science and Technology
- Considering the People
- Considering Threat Assessment
- Improving Threat Assessment

A summary report of the workshop may be found at https://cgsr.llnl.gov/content/assets/docs/DogsSummaryReportFinal.pdf.

Science and Technology

Collingridge, David. (1980). *The Social Control of Technology.* New York: St. Martin's.

Collingridge focuses on the sources, justification and explanation of technological decision-making. He assesses the core issue of the dilemma of controlling technologies to prevent their undesired effects to society and the ability to do so, a task that comes in natural opposition to technologies' inherent resistance to such control. Collingridge develops his arguments around the notions of the costs of error, control, and monitoring of technologies and provides rationale for past decisions on the development and use of technological resources.

Falkenrath, Richard A., Robert D. Newman and Bradley A. Thayer. (1998). *America's Achilles' Heel: Nuclear, Biological, and Chemical Terrorism and Covert Attack.* Cambridge, MA: MIT.

Falkenrath, Newman, and Bradley discuss how nuclear, biological, and chemical (NBC) weapons delivered covertly by terrorists or hostile governments pose a significant and growing threat to the United States and other countries. Although the threat of NBC attack is widely recognized as a central national security issue, most analysts have assumed that the primary danger is military use by states in war with traditional military means of delivery. The threat of covert attack has been neglected. This volume analyzes the nature and limits of the covert NBC threat and proposes a measured set of policy responses, focused on improving intelligence and consequence-management capabilities to reduce U.S. vulnerability.

Jefferson, Catherine, Filippa Lentzos and Claire Marris. (2014). Synthetic Biology and Biosecurity: Challenging the "Myths." *Frontiers in Public Health Front. Public Health 2: 1-15.* Imperial College.

This paper investigates assumptions regarding the dangers of “de-skilling” biology, specifically how this process may make biology increasingly accessible to people operating outside of laboratories, possibly for nefarious purposes. Jefferson, Lentzos & Marris do not discount these assumptions, but find that acquiring tacit knowledge and having ample time and training weigh on the likelihood they may occur. Also considered is the fact that pathogens are rarely manufactured as opposed to inadvertently created, and the number of potential casualties is likely to be low due to imperfect conditions. Some assumptions may persist due to researchers attracting attention and resources to their own work and exaggerating the ease of synthetic biology.

Jefferson, Catherine, Filippa Lentzos and Claire Marris. (2014) *Synthetic Biology and Biosecurity: How Scared Should We Be?* Workshop Report. London: King's College.

This workshop explored aspects of Synthetic Biology, including the probability that terrorist groups may be able to use this technology to commit acts of violence. Tacit knowledge and socio-technical factors were found to limit the possibility of reproducing experiments based only on informational aspects of science, although some members argued that these barriers will become irrelevant in the future as biotechnology becomes an engineering discipline. Debate also existed around which aspects of production will be automated and which will continue to require specialized knowledge. Media reports and the exaggeration of the dual use threat in order to attract resources were also areas of concern.

Marris, Claire, Catherine Jefferson and Filippa Lentzos. Negotiating the Dynamics of Uncomfortable Knowledge: The Case of Dual Use and Synthetic Biology. *BioSocieties 9*. Palgrave Macmillan.

The authors use the concept of "Known Unknowns" to discuss three areas of synthetic biology and biosecurity that are often omitted from policy discussions and threat assessments. These areas of "uncomfortable knowledge" include Tacit Knowledge, Challenges to the Linear Model of Innovation, and Context-Dependent Dangerousness. This paper finds that actors who share a particular culture will construct knowledge and ignorance in a way that most easily satisfies the goals of that institution, which leads to erroneous assessments and policy. Therefore, areas of "uncomfortable knowledge" must be included in discussions of policy to produce more targeted, useful assessments.

Nightingale, Paul, and Paul Martin. (2004). The Myth of the Biotech Revolution. *Trends in Biotechnology 22.11*. University of York.

Nightingale and Martin argue that although the existence of a "Biotech Revolution" has been widely accepted, outputs have failed to keep pace with increased spending, and that biotechnology is actually following a well-established pattern of slow and incremental diffusion. The conflict between the idea of a revolution and the reality is due in part to the need for innovators to create high expectations (hype) in order to increase visibility and funding. Assumptions underpinning policy-making in this area need to be rethought, and new policy needs to address the uncertain, systemic nature of technical change. The current assumptions are dangerous because, for the present, they are leading to poor investment decisions and distorted priorities regarding the prevention of illness and disease.

Rappert, Brian. (2014). Why Has Not There Been More Research of Concern? *Frontiers in Public Health Infectious Diseases 2*. *Frontiers in Public Health.* Frontiers Media S.A.

Rappert recounts the history of "research of concern," pointing out that life science research could potentially facilitate the spread of disease and could be used for destructive purposes, but that "instances of concern" are relatively uncommon. He then examines the limitations of concern framing, as well as the politics of expertise. Risk-benefit assessments of biological research have limitations when the outcomes and probabilities of such risks are straightforward and consensually characterized. Rappert suggests the use of precautionary orientations in place of risk-benefit assessments, which acknowledge conditions of uncertainty, ignorance and ambiguity, and investigate how issues can be investigated in spite of those conditions.

Schroeder, Matt. (2016). Report Examines MANPADS Threat and International Efforts to Address It. *Federation of American Scientists*.

Schroeder analyzes the global counter-MANPADs campaign. He analyzes how this campaign has yielded significant results, including development of anti-missile systems for use on commercial aircraft and a better understanding of challenges associated with the large-scale deployment of these systems. Despite this progress, the MANPADS threat persists.

People

David H. Freedman, (2010). *Wrong*: *Why Experts Keep Failing Us—And How to Know When Not to Trust Them.* New York, NY: Little, Brown and Company.

Freedman examines how scientists, financial advisors, health researchers, and many other "experts" are at least as likely to be wrong as they are right. Freedman's work explains the many flaws and shortcomings that often make their way into research and the role incentives and rewards play in perpetuating these flaws.

Guice, Jon. (1999). Designing the Future: The Culture of New Trends in Science and Technology. *Research Policy*. ScienceDirect.

Activities and communications which refer to or assume a particular vision of the future play a role in shaping social relations and creating meanings. Those futures are ultimately believed and acted on, as Guice shows in his examination of the promotion of Neural Networks by DARPA. Two forms of argument are endemic to trend-promotion in science and technology: intended self-fulfilling prophecy and emotional rhetoric. Promotion requires institutional and cultural analysis. However, it is difficult to trace the origins of trends, because promoters lose credibility if they are visible, and derive the highest gain from erasing the traces of their own work.

Hymans, Jacques E. C. (2012). *Achieving Nuclear Ambitions: Scientists, Politicians and Proliferation.* Cambridge: Cambridge University Press.

Hymans focuses on the relations between politicians and scientific and technical workers in developing countries. By undermining the worker's' spirit of professionalism, developing country rulers unintentionally thwart their own nuclear ambitions. Hymans uses a theoretical analysis, in-depth historical case studies of Iraq, China, Yugoslavia and Argentina and analyses of current-day proliferant states.

Ouagram-Gormley, Sonia. (2014). *Barriers to Bioweapons, The Challenges of Expertise and Organization for Weapons Development.* Ithaca: Cornell University Press.

Ouagrham-Gormley challenges the perception that states or terrorist groups can easily produce bioweapons by showing that bioweapons development is a difficult, protracted, and expensive endeavor, rarely achieving the expected results whatever the magnitude of investment. Her findings are based on extensive interviews she conducted with former U.S. and Soviet-era bioweapons scientists and on careful analysis of archival data and other historical documents related to various state and terrorist bioweapons programs.

Parachini, John. (2003). Putting WMD Terrorism into Perspective. *The Washington Quarterly*.

Parachini argues terrorists will not necessarily escalate to unconventional weapons, such as Weapons of Mass Destruction (WMD), and that paying inordinate attention to WMD terrorism risks diverting scarce resources away from more likely threats that could be prevented.

Wright, Susan. (2006). Terrorists and Biological Weapons. *Politics and the Life Sciences*.

Wright draws on a wide variety of sources including government documents, policy papers and books, conference records, media materials, memoirs, and detailed interviews with nine subjects selected from among participants in the events examined. It shows that the nature of a linkage between terrorism and biological weaponry was debated at many levels

in Washington, and it offers reasons why, ultimately, a counter bioterrorism "bandwagon" was constructed and began rolling at the end of the second Clinton administration.

Tetlock, Philip E. (2005). *Expert political judgment: How good is it? How can we know?* Princeton: Princeton University Press.

Tetlock first discusses arguments about whether the world is too complex for people to find the tools to understand political phenomena, let alone predict the future. He evaluates predictions from experts in different fields, comparing them to predictions by well-informed laity or those based on simple extrapolation from current trends.Tetlock notes a perversely inverse relationship between the best scientific indicators of good judgement and the qualities that the media most prizes in pundits--the single-minded determination required to prevail in ideological combat.

Atran, Scott. (2010). *Talking to the Enemy: Violent Extremism, Sacred Values, and What It Means to be Human.* New York: Penguin Group, Inc.

Scott Atran explores the way terrorists think of themselves and offers readers a look deep inside terror groups. Based on the author's unprecedented access to and in depth interviews with terrorists and jihadis, including Al Qaeda, Hamas, and Taliban extremists, as well as members of other radical Islamic terror organizations, Atran provides fresh insight and unexpected answers to why extremists are willing to kill and die for a cause.

Gambetta, Diego, and Steffen Hertog. (2016). *Engineers of Jihad: The Curious Connection Between Violent Extremism and Education.* Princeton: Princeton University Press.

Diego Gambetta and Steffen Hertog analyze two major facts: disproportionate share of Islamist radicals come from an engineering background, and that Islamist and right-wing extremism have more in common than either does with left-wing extremism, in which engineers are absent while social scientists and humanities students are prominent. The authors answer four general questions about extremism: Under which socioeconomic conditions do people join extremist groups? Does the profile of extremists reflect how they self-select into extremism or how groups recruit them? Does ideology matter in sorting who joins which group? Lastly, is there a mindset susceptible to certain types of extremism?

Roberts, Brad, editor. (2000). *Hype or Reality: The "New Terrorism" and Mass Casualty Attacks.* Alexandria, VA: Chemical and Biological Arms Control Institute.

The authors discuss whether terrorists are as likely to use weapons of mass destruction to conduct mass casualty attacks as many fear or whether this is an overhyped phenomenon. The book investigates whether a new form of terrorism with the intention to kill masses has really emerged or whether this theory has changed less than the rhetoric would suggest.

Roberts, Brad, editor. (1997). *Terrorism with Chemical and Biological Weapons: Calibrating Risks and Responses.* Alexandria, VA: Chemical and Biological Arms Control Institute.

The authors provide an analysis of the kinds of terrorist groups that might be attracted to chemical and biological weapons, the barriers to these acts of terrorism, and the appropriate policy response. They analyze whether the use of chemical and biological weapons is a challenge that can be met with long term commitment of political will and necessary resources.

Assessment

Hopkins, Michael M., Paul A. Martin, Paul Nightingale, Alison Kraft, and Surya Mahdi. (2007). The Myth of the Biotech Revolution: An Assessment of Technological, Clinical and Organisational Change. *Research Policy*. ScienceDirect.

This paper extends critiques of the model of technological changes currently used to understand medicinal biotechnology. Examination reveals that the Revolutionary model is deficient, and that technology is following a historical pattern of slow and incremental change. While biotechnology has increased the number of drug targets and early stage improvement, productivity as a whole has continued to decline. However, quantitative decline in this area may hide qualitative improvements. Although further questioning is needed regarding the assumptions of policy design and the danger of overhyping, creation of widespread expectations through hype is an important part of technological change itself.

Noah, Timothy. (2009). Why No More 9/11s? *Slate Magazine.* The Slate Group.

Noah investigates the issue of why no large scale attacks on the US homeland have occurred since September 11, 2001, in contradiction to multiple warnings by advisors and policy-makers. He presents eight theories in an attempt at explanation, including examinations of the social, economic and political factors that may have influenced individual terrorists and terrorist organizations, as well as those influencing American Muslims. He also discusses George W. Bush, the War on Terrorism, and the electoral cycle of the United States as having possible influence on terrorist attacks or the lack thereof.

Sung, John J., and Michael M. Hopkins. (2006). Towards a Method for Evaluating Technological Expectations: Revealing Uncertainty in Gene Silencing Technology Discourse. *Technology Analysis & Strategic Management*. Taylor & Francis Online.

Sung and Hopkins discuss generalized and specific frames in the case of Gene Silencing Technology and examine the frame conflict that may arise if aspects of a situation do not exist in the generalized frame. This leads to uncertainty or incorrect assumptions. Uncertainty is also correlated with conceptual distance, the difference between past/present and future aspects of expectations (hype). As distance between past/present and future grows, uncertainty increases. Rather than providing an evaluation of the likelihood that expectations will be realized in relation to technology, this paper provides a useful method for organizing aspects of expectations in order to reduce epistemological asymmetry.

Vogel, Kathleen M. (2013). *Phantom Menace or Looming Danger?: A New Framework for Assessing Bioweapons Threats.* Baltimore: Johns Hopkins University Press.

Vogel argues for a major shift in how analysts assess bioweapons threats. She calls for an increased focus on the social and political context in which technological threats are developed. Vogel uses case studies to illustrate her theory: Soviet anthrax weapons development, the Iraqi mobile bioweapons labs, and two synthetic genomic experiments. She concludes with recommendations for analysts and policymakers to integrate sociopolitical analysis with data analysis, thereby making U.S. bioweapon assessments more accurate.

Vogel, Kathleen M. (2013). The Need for Greater Multidisciplinary, Sociotechnical Analysis: The Bioweapons Case. *Studies in Intelligence*. Central Intelligence Agency.

Vogel argues that several aspects are missing from dominant technological framework concerning bioweapons analysis: Tacit Knowledge, needs related to production such as

manpower and context, social and material conditions required for equipment to work in different locations, recognition that even professional industries have struggled to harness new developments, and the role of specific social actors. To better comprehend these forces, sociotechnical assessments must be created. Recommendations to form and improve these assessments involve the Red Team approach, where teams might inject greater multidisciplinary approaches in the assessment of a multitude of technologies and specifically challenge dominant technical approaches.

Borup, Mads, Nik Brown, Kornelia Konrad, and Harro Van Lente. (2006). The Sociology of Expectations in Science and Technology. *Technology Analysis & Strategic Management*. Taylor & Francis Online.

The authors examine expectations related to innovation, which cannot work in isolation from a large body of understanding concerning future scenarios. Due to a recent strategic turn in scientific innovation, which includes a wide variety of potential collaborators, expectations have become increasingly important as joint visions which extend across different areas of interest. They are also a necessary mobilizing force, informing cycles of hype and disappointment.

Brekhus, Wayne H. (2000). A Mundane Manifesto. *Journal of Mundane Behavior*.

Sociologist Wayne Brekhus argues that the extraordinary draws disproportionate attention from researchers distorting our picture of reality. Brekhus explains that focusing attention on certain things while ignoring others results in a marked-unmarked relationship that perpetuates stereotypical thinking producing an extreme rather than accurate picture of reality.

Committee on Behavioral and Social Science Research to Improve Intelligence Analysis for National Security. (2011). *Intelligence Analysis for Tomorrow: Advances from the Behavioral and Social Sciences.* Washington, D.C.: The National Academies Press.

The book presents challenges related to intelligence analysis, including the structure of the Intelligence Community, collaboration and working within teams, reliance on intuitive appeal rather than evidence-based evaluation, uncertainty, assumptions and biases. It recommends using analytical methods supported by scientific method, and points out the need for rigorous testing under realistic conditions. Also investigated are the propositions of giving members of the intelligence community short academic assignments, providing methodological assistance, and instilling a culture that values continuous improvement.

Jervis, Robert. (2010). *Why Intelligence Fails: Lessons From the Iranian Revolution and the Iraq War.* Ithaca: Cornell University Press.

Jervis discusses how the U.S. government spends enormous resources each year on the gathering and analysis of intelligence, yet the history of American foreign policy is littered with missteps and misunderstandings that have resulted from intelligence failures. Jervis examines the politics and psychology of two of the more spectacular intelligence failures in recent memory: the mistaken belief that the regime of the Shah in Iran was secure and stable in 1978, and the claim that Iraq had active WMD programs in 2002. In Jervis's estimation, neither the explanations nor the prescriptions are adequate. Evaluating the inherent tensions between the methods and aims of intelligence personnel and policymakers from a unique insider's perspective, Jervis criticizes proposals for improving the performance of the intelligence community and discusses ways in which future analysis can be improved.

Johnston, Rob. (2005). *Analytic Culture in the US Intelligence Community: An Ethnographic Study.* Washington, D.C.: Center for the Study of Intelligence, Central Intelligence Agency.

Johnson's study of the US intelligence community involved hundreds of interviews in dozens of work groups in intelligence analysis. His findings constitute a strong indictment of the way American intelligence performs analysis and a guide on how to improve intelligence analysis.

Kerr, Richard, Thomas Wolfe, Rebecca Donegan, and Aris Pappas. (2007). A Holistic Vision for the Analytic Unit. *Studies in Intelligence*. Washington, D.C.: Center for the Study of Intelligence, Central Intelligence Agency.

This paper examines the analytical process, and argues for intelligence analysis that focuses on the working of basic analytic units, comprising physical and virtual bodies through their area of responsibility. These units should perform research, produce estimates, establish collection priorities, and manage IC funding. The authors argue that analysts and collectors should no longer be separated, and new approaches to information collection must be given high priority. Leadership should be comprised of senior personnel, and different perspectives related to analytic products must be developed.

Kerr, Richard, Thomas Wolfe, Rebecca Donegan, and Aris Pappas. (2007). Issues for the US Intelligence Community. *Studies in Intelligence*. Washington, D.C.: Center for the Study of Intelligence, Central Intelligence Agency.

This paper investigates whether the US intelligence community's flawed performance on Iraq represents a one-time problem or a symptom of deeper, more long-standing challenges. The authors point out that the IC was engineered to deal with the Soviet Union, and struggled to re-establish identity. Other shortcomings include satellite monitoring and other technical capabilities, which were able to provide accurate information on relatively few critical issues. Little attention was likewise paid to social, cultural and economic impacts. Requirements to have background and contextual information to policy makers in a timely manner have failed. The authors conclude the IC must evolve and adapt to changing circumstances, as the alternative is unthinkable.

Nolan, Janne E., and Douglas J. MacEachin. (2006). *Discourse, Dissent, and Strategic Surprise: Formulating U.S. Security Policy in an Age of Uncertainty.* Washington, D.C.: Institute for the Study of Diplomacy, Georgetown University.

In this book, case studies of events that proved damaging to US interest are used to assess current security policy. The study found that instances of surprise related to security usually have to do with the way information is interpreted, adherence to a strategic framework that limited what was accepted as a threat, and the need to adhere to the precepts of an accepted strategy in spite of conflicting evidence. Cases also investigated instances where intelligence products were dismissed by policymakers, instances of excessive compartmentalization of information, and the tendency to perceive countries as important insofar as they could advance US strategic objectives.

Olcott, Anthony C. (2011). Five Decades of Ignoring Our Own Advice: Why Inertia Trumps Reform. *ISD Working Papers in Diplomacy*. Georgetown University.

Olcott discusses the study of the CIA with regard to intelligence failures. Fear of being accused of an intelligence failure leads analysts to feel like they must cover every possible topic, resulting in larger collection efforts that lead to an excess of information. Bureaucracy also poses a challenge to improvements in the process, as an organization will only accept new functions that will not threaten its existing leadership and that will bring additional

resources. Olcott also discusses responses to intelligence failure and issues related to the collective as opposed to the individual.

Olcott, Anthony C. (2010). The Challenges of Clashing IC Interests. *International Journal of Intelligence and Counterintelligence*. Taylor & Francis Online.

This paper argues that outreach in the intelligence community is exceedingly difficult, mostly due to conflicting motivations between "Guardians," who strive to protect and secure information, and "Traders," who seek to share and innovate. Both systems of survival are needed, but if the combining of Guardians and Traders is not handled carefully, a system that utilizes the worst of both worlds could result. Olcott discusses strengthening the value of IC contributions to outside analytics, and measuring what value IC products have to consumers (policymakers). Olcott concludes that there is no longer a shortage of valuable information, only a shortage of processing capabilities. The instinct of the IC to safeguard its secrets may be undermining its usefulness.

Pelopidas, Benoit. (2011). The Oracles of Proliferation: How Experts Maintain a Biased Historical Reading That Limits Policy Innovation. *Nonproliferation Review*. Middlebury Institute of International Studies at Monterey.

Benoit argues that assumptions about nuclear proliferation, which are shared by US experts and policy makers, distort facts, lead to a conservative bias, and limit the possibility of political innovation. Assumptions and metaphors limit the cognitive framework through which one conceives the phenomenon of nuclear weapons and proliferation, as they lay the foundations for a belief in the inevitable increase of nuclear weapons and weapons states. Change in policy are needed to counter biases: nuclear weapons are not intrinsically desirable, decisions of whether nations will acquire weapons cannot be objectively answered, and the role of experts should be redefined.

Posner, Richard A. (2006). *Uncertain Shield: The U.S. Intelligence System in the Throes of Reform.* Lanham, MD: Rowman & Littlefield.

Posner argues that the decisions about structure that the US government made in implementation of the Terrorism Prevention Act of 2004 are creating a too top-heavy and too centralized intelligence system. The book exposes fallacies in criticisms of the performance of the U.S. intelligence services, analyzes structures and priorities for directing and coordinating U.S intelligence in the era of global terrorism, and exposes the inadequacy of the national security networks.

Tetlock, Philip E., and Dan Gardner. (2015). *Superforecasting: The Art and Science of Prediction*. New York: Crown Publishers.

Tetlock and Gardner offer a framework for prediction, drawing on decades of research and the results of a massive, government-funded forecasting tournament. The authors analyze stories of forecasting successes (the raid on Osama bin Laden's compound) and failures (the Bay of Pigs) and interviews with a range of high-level decision makers, to conclude that good forecasting does not require powerful computers or arcane methods.